

WHITE (J. W.) & Wood (A. C.)
With the Authors' Compliments.

THE TREATMENT OF EMPYEMA, WITH SELECTED CASES.

BY

J. WILLIAM WHITE, M.D.,

Professor of Clinical Surgery in the University of Pennsylvania; Surgeon
to the University, Philadelphia, and German Hospitals.

AND

ALFRED C. WOOD, M.D.,

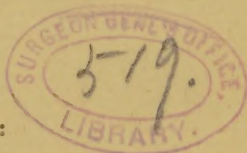
Assistant Surgeon to the University and Gynceean Hospitals; Instructor in
Clinical Surgery in the University of Pennsylvania.

REPRINTED FROM THE THERAPEUTIC GAZETTE, AUGUST 15, 1894.

DETROIT, MICH. :

GEORGE S. DAVIS, PUBLISHER.

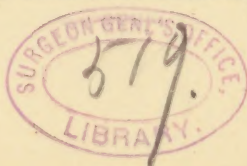
1894.



The Treatment of Empyema, with Selected Cases.

IN its broadest application an empyema is a collection of pus in one of the natural cavities of the body. As usually employed, however, it refers to a purulent collection in the pleural sac, and it is here used in this sense. Among the common causes of this condition are a previous pleural effusion which has become purulent, or as occurs in the course of various infectious diseases, the collection may be purulent from the beginning. Occasionally an empyema may result from an hepatic abscess which has perforated the diaphragm, from a pulmonary abscess which has discharged through the pleura, or from an abscess elsewhere which has found its way into the pleura. Finally, it may result from a fractured rib or a penetrating wound of the chest.

Fluid collections in the pleural sac may accompany, besides pleurisy, simple and tuberculous pneumonia, pulmonary tuberculosis, and typhoid fever. The exudation in these cases is serous or sero-fibrinous, and may remain in this condition or may become purulent. In the light of our present knowledge, the change from the serous to the purulent condition must be explained by the invasion of micro-organisms.



The bacteriology of this subject has received considerable attention in recent years. As the result of his investigations, Bewley (*Dublin Journal of the Medical Sciences*, 1890) makes the following classifications of empyema :

1. Those cases in which ordinary pyogenic micrococci make their way into the pleural sac through an opening in the chest-wall or from the lung, by the bursting of a pulmonary abscess, or gangrene, into the pleural cavity.

2. Those cases occurring in connection with croupous pneumonia and caused by pneumococci.

3. Those occurring in persons afflicted with phthisis, and which are tubercular.

4. Those cases in which, under various circumstances, pyogenic micrococci are able to enter and live for some time in the tissues of the body without doing harm.

5. Those cases which are a part of a general pyæmia.

Coplick (*Archives of Pediatrics*, 1890) records his results of careful bacteriological investigations of twelve cases of empyema in children. These cases are divided as follows :

1. Those in which the bacterioscopic results are not uniform and the micro-organisms found not diagnostic.

2. Those in which he was able to establish the presence of the pneumococcus of Fränkel and Weichselbaum in the purulent exudate.

3. Empyema occurring in tubercular subjects.

4. Those cases in which a focus of suppuration situated outside the chest can be pointed to with a degree of probability as the possible source of infection. He arrives at the conclu-

sion that a large proportion of empyemas in children follow or complicate processes in the lung of an acute character.

Parmenter (*Buffalo Medical and Surgical Journal*, January, 1894) quotes the classification of Courtois-Suffit, which divides cases of purulent pleurisy into (a) pure and (b) mixed forms. The first class includes,—

1. Empyema from the pneumococcus. This is said to form twenty-five per cent. of the purulent pleurisy of adults and fifty per cent. of the same affection in children.

2. Empyema from the streptococcus. This is the common microbe of suppuration.

3. Empyema from the bacillus tuberculosis.

4. Empyema due to the encapsulated bacillus of Friedländer and to the typhoid bacillus of Eberth. These forms are said to be rare.

Mixed forms include,—

1. Empyema due to the pneumococcus and the streptococcus together.

2. Empyema due to the typhoid bacillus and the streptococcus.

3. Empyema due to the bacillus tuberculosis and the streptococcus, or to the staphylococcus, or both together.

4. Putrid or gangrenous empyema. In addition to the streptococcus and the staphylococcus, the micro-organisms of putrefaction are present.

It will thus be seen that a number of competent independent observers, after carefully-conducted experiment, have arrived at practically uniform results,—namely, the demonstration of the constant presence of microbes in empyemas. It is a question whether those cases in which the pneumococcus or the bacillus tuberculosis

only are found should be classed as strictly purulent collections, although the fluid may be turbid from admixture of fibrin and leucocytes. It is more in harmony with what is known of this process elsewhere to consider the purulent process to be due to the presence of pus microbes alone or to a mixed infection.

It will be, perhaps, impossible clinically to classify many of the cases that are observed, but this does not seriously modify the treatment which should be instituted. The previous history will, of course, have an important bearing in many instances. If we know, for example, that an attack of pneumonia, influenza, or typhoid fever has preceded the pleurisy, and if there is no other cause to explain its presence, an etiological relation may be inferred, or if the patient is known to have previously suffered from pulmonary tuberculosis, it is reasonable to suppose that the case is of this nature.

The symptoms of purulent pleurisy may develop suddenly, but more frequently the onset is insidious, in which case the pleural collection is very apt to be overlooked unless this possibility is borne in mind. There is, however, usually fever of an irregular type, pain in the chest, cough, and dyspnoea on exertion, although any or all of these may be wanting.

The diagnosis is to be made by eliciting the usual signs of fluid in the chest and determining the character of the fluid by the exploring-needle. It must be borne in mind that the physical signs, like the symptoms, may be obscure, but by a careful examination of the chest a mistake will be infrequent. This, of

course, is always to be confirmed by hypodermic puncture.

An empyema may terminate in spontaneous cure by absorption of the fluid, in perforation of the lung and expectoration of the collection, or by perforation of the chest-wall. This termination is very rare, however, and the condition, if unrelieved, tends to a fatal issue.

Treatment.—The presence of pus in the pleural cavity having been detected, the use of drugs is not to be considered, except in so far as is made necessary by the general condition of the patient.

The different methods of operating for the relief of this condition have been classified by Steele as follows:

1. Aspiration.
2. Aspiration and antiseptic irrigation.
3. Thoracocentesis with trocar and canula.
4. Thoracocentesis, with subsequent drainage.
5. Simple incision.
6. Incision and drainage.
7. Incision, with through-and-through drainage, with or without the addition of antiseptic measures.
8. Subperiosteal resection of a rib and drainage.
9. Thoracoplasty (Estlander's operation).
10. Perflation.

A pleural effusion having been recognized, if of recent formation, and if the patient's strength be good, careful aspiration with aseptic precautions may be done. If the effusion is one of long standing, and if the patient's condition is one of hectic, showing that the blood is already poisoned from absorption, then free drainage

must be at once instituted. If the needles used in the aspiration are surgically clean, it need not be feared that on account of the puncture, if the fluid reaccumulates, it will assume a more unfavorable character than before. Should the accumulation return, then a more radical operation becomes necessary for its relief.

A review of the literature of the subject impresses one with the marked diversity of opinion still existing in the profession regarding the relative merits of the several procedures enumerated. For example, Immermann (*Deutsche Med. Woch.*, 1887) advocates simple aspiration, and objects to costal resection on account of the resulting deformity. He considers Bülow's siphon drainage, or aspiration drainage, the ideal treatment. This method is also highly endorsed by Powel, Curschmann, Runneburg, and others.

Steele, on the other hand, has collected one hundred and twenty-one cases treated by aspiration (*Journal of the American Medical Association*, 1888). Of these, but twenty-three (nineteen per cent.) were cured, six died, and the balance were sooner or later subjected to a more radical treatment, usually incision.

Mader, Rogée, Rochelt, and Williams have devised special valvular tubes, which are intended, when introduced in the chest-wall, to allow the escape of fluid from the pleural cavity, but to prevent the entrance of air. In all of these methods the dominant idea is to withdraw the fluid without allowing the ingress of any air into the pleural sac.

Even conservative writers generally concede, however, that when the chest contains pus, nothing short of thoracotomy will suffice to

meet the indications present. The operation is a simple one, and may be performed quickly and safely, barring the danger which may attend the rapid withdrawal of a large collection of fluid from the pleural cavity. No attempt need be made to prevent the entrance of air within the chest. The results of this operation have been very good, as is attested by many reported cases. For instance, Griffith (*British Medical Journal*, 1887) reports fifty cases treated by this method. Of these, thirty-five recovered, five were discharged with sinuses still open, and six died, three from already advanced phthisis.

Owing to difficulty in securing free drainage by simple incision, frequently on account of the close proximity of adjacent ribs, costal resection to accomplish this object has been advised and practised by a large number of surgeons. This allows of very free drainage and, if need be, intrathoracic exploration, without adding anything to the dangers of simple thoracotomy. The results obtained by costal resection are much better than by the other methods described. As an example of the utility of this operation the experience of Holsti may be quoted. This author reports (*London Medical Record*, 1887) twenty-seven cases of empyema operated on by excising a portion of one rib, followed by the introduction of two drainage-tubes; of these, twenty-four recovered, two were discharged with a fistula, and one was under treatment at the time of making the report. Among others who employ this method may be mentioned Schede, Pel, and König.

Finally, Estlander advocated the resection

of portions of several contiguous ribs. This method is especially applicable to those chronic cases in which the lung has little or no tendency to expand after the withdrawal of the fluid. Many cases are reported which attest the value of this operation. The object aimed at in Estlander's thoracoplasty is, by removing portions of several ribs, to allow the chest-wall to retract to meet the more or less collapsed lung, and, by the formation of adhesions, to secure obliteration of the pleural cavity. To be successful, a sufficient number of ribs should be resected to accomplish the desired result. Böckel reports a case in which he removed portions of seven ribs and part of the scapula; the patient recovered and improved in health. He says that want of success in this operation is due to too great timidity on the part of the surgeon.

Richelot and Moreau, following Quenu, have performed section of the ribs, without removing any portion, to secure the sinking in of the chest-wall, as follows Estlander's operation. It would not appear that this method possessed any advantage over the latter, while it must be less certain in its beneficial effects.

The position of the opening is a matter upon which most authors lay considerable stress. Sutherland (*Lancet*, London, January 27, 1894) differs from this view, and states that the selection of the point for the introduction of the drainage-tube may be made quite apart from any considerations of drainage. The emptying of the pleural cavity, he contends, is not due to the action of gravity, but to the forcible expulsion of the fluid by the expansion of the lung and the pushing up of the diaphragm.

If these are secured, he says, the fluid will be driven out irrespectively of the position of the opening, and such arrangements as a dependent opening or two openings are quite unnecessary. There will usually be no contraindication, however, to opening at a low point, and we believe that this plan will be followed more uniformly by good results.

The other methods of treatment mentioned have nothing to recommend them and need not be further considered.

That no one operation will be uniformly indicated in every case of empyema will be accepted without argument, but a tendency towards overdue conservation has certainly existed. The safety of a patient does not always lie in doing the least that is possible. We know that with imperfect drainage in empyemas, as in all other collections, sinuses remain indefinitely and continue to secrete pus, thus exposing the patient to the danger of amyloid degeneration of the viscera. It may be put down as established, that in those cases in which sinuses persist, the drainage has been imperfect. Osler ("Practice of Medicine," 1892) pertinently says, "It is sad to think of the number of lives which are sacrificed annually by the failure to recognize that empyema should be treated as an ordinary abscess, by free incision." Such a commentary from so distinguished an authority should awaken both physicians and surgeons to a proper appreciation of the necessity for early and free drainage. Another common error results from the mistaken conception of "free drainage." It is a not infrequent experience to see cases in which, in spite of alleged free drainage, im-

provement is not observed, and upon investigation it is found that the drainage *did not drain*. There are few affections in which surgery can claim greater success than in empyema. It is not uncommon to observe a patient pale and exhausted by his long illness, with cough, irregular fever, clammy sweats, and lost appetite, become free from fever and sweats, and regain his appetite, color, and strength after having properly drained a long pent-up empyema. That operation is, therefore, indicated which will give the freest exit to the purulent collection. Küster employs the following method: Following exploratory puncture, an incision is made in the fourth or fifth interspace, anteriorly; a silver sound is introduced through the opening and carried to the deepest part of the pleural sac, posteriorly. The point of the sound is pressed against the chest-wall until it can be felt in an intercostal space, when the rib above is resected. A long drainage-tube is passed through both openings, and the chest-cavity washed with a weak salicylated water.

It is desirable to remove the drainage-tube as soon as can be safely done, in order to secure the healing of the external wound and the expansion of the lung. To promote the latter, during the entire course of treatment and for a considerable period thereafter pulmonary gymnastics should be systematically carried out. This may be conveniently done by making forcible straining efforts, whereby the air in the healthy lung is forced into and expands its fellow. The same object is very well accomplished by having the patient force water by expiratory efforts from one bottle to another,

the bottles being arranged after the manner of Wolff's bottle.

Küster's plan is probably unnecessarily heroic, although, if the patient's strength were not too far exhausted, no harm would come from the second opening. This plan has not been adopted, however, in the cases recorded, but care has always been taken to establish the freest drainage. The operation is equally indicated in both extremes of life and the presence of fever is not a contraindication.

The question of irrigating the pleural cavity after the operation has been the subject of much discussion. It has been our practice to irrigate the pleura until the fluid came away clear ; no harm has seemed to us to follow this procedure. Cases are recorded, however, in which sudden collapse or convulsions have occurred during the irrigation. Bowditch strongly objects to irrigation in empyema : first, because it is unnecessary, in his opinion ; and, second, because it is not free from danger. He says that he has only once thought it necessary to irrigate in three hundred and ninety-nine operations. De Cérenville, Runeberg, Robertson, Basel, and Bonberet hold the same opinion.

The following technique for resection of the ribs seems to us to best meet the indications :

1. The portion of the rib selected for removal should be that between its angle and sternal attachment. Posterior to this it is more immovable and situated so closely to the adjoining ribs that the difficulties of the operation are greatly increased.

2. Those ribs between the third and the

tenth should be selected which most accurately overlies the cavity.

3. The number of ribs operated upon should be proportionate to the extent of the cavity.

4. The length of the pieces excised should be proportionate to the depth of the cavity.

5. The operation should be done aseptically and subperiosteally, and when so performed is almost without danger; and even in cases where large portions of ribs are removed is followed by no permanent loss of function in the external respiratory muscles of that side.

It should be unnecessary at this time to insist upon the usual antiseptic details employed in modern surgery. Without this precaution the character of the discharge is apt to be unfavorably influenced by the entrance of other micro-organisms than those already present.

The ribs may be exposed by an incision parallel with and upon the rib, but it is less satisfactory than the method of making a curved incision exposing the portion of rib to be excised. This incision is the more desirable when portions of two or more ribs are to be removed, as it obviates the necessity of making multiple incisions. The periosteum is to be separated from the rib by the ordinary elevator, and by keeping the latter close to the under surface of the rib the intercostal artery may be separated with the periosteum and thus escape injury.

Free drainage is best obtained by introducing the ordinary pure rubber drainage-tube, which should, however, be of ample size. Some method must be employed to prevent the escape of the tube in the pleural cavity,

where its subsequent detection and removal would be difficult, while the presence of the tube in the chest would keep up the very condition which its original employment was intended to relieve. A satisfactory method for retaining the tube is to stitch it to the margin of the wound. Another method consists in using a flat disk of hard rubber, with a hole in the centre corresponding in size with the calibre of the rubber tube, one end of which may be split into three or four portions, which are to be stitched to holes in the disk. The drainage-tube should be covered over with a liberal dressing of iodoform gauze or other antiseptic material. The subsequent treatment should consist in changing the dressing as frequently as necessary, and where there are no contraindications we believe it desirable to irrigate the cavity at each dressing. For this purpose a saturated solution of boric acid is perhaps the best. If the fluid is of a pronounced purulent character, the use of hydrogen peroxide in full strength or diluted will be beneficial. It should not be employed, however, if the opening in the chest is not large enough to give free exit to the gas which is formed, otherwise it is possible that a sufficient degree of pressure might be caused to interfere somewhat with respiration and circulation.

Attention should also be given to the general health of the patient. A sufficient quantity of easily-digested food should be administered. The hypophosphites, cod-liver oil, iron, and arsenic may one or more be indicated. An out-of-door atmosphere and the direct rays of the sun are also important.

The question of the removal of the tube is

frequently difficult to decide ; the general rule is, however, to gradually shorten it as the cavity contracts.

The only contraindications to costal resection would appear to be advanced pulmonary phthisis or an empyema complicating a general pyæmic state.

Age has no bearing on the indications of the operation. Cases are reported which have been successfully operated upon in the first year of life, and the same is true of advanced years ; in both instances the presence of retained pus is a more serious condition than the effects of the operation.

The following cases have been selected from those occurring in Dr. White's practice :

CASE I.—*Empyema ; Incision ; Imperfect Drainage ; Resection of One Inch of the Fifth and Sixth Ribs ; Recovery.*—C. M., aged fifty-three years, farmer, gave the following history : Eighteen months previously, following the influenza, the patient had pleuro-pneumonia, which confined him to bed for three months. During this time and for about a year subsequently he had persistent loose cough with considerable expectoration. About a year after the beginning of the present illness the patient complained of pain on the right side on coughing, and soon afterwards an abscess appeared between the seventh and eighth ribs of that side. This was incised and a large quantity of pus evacuated, with almost complete relief of the cough. The discharge continued to be quite free, and during the past few weeks the cough has again increased in severity. The patient has lost fifteen or twenty pounds in the past year. Nothing in the family history

had any bearing in the case. The patient had never been strong.

As there was evidently imperfect drainage, it was decided to resect portions of the fifth and sixth ribs in the anterior axillary line. For this purpose a horseshoe-shaped incision, with the base upward, was made, exposing these two ribs, and about one inch of each was removed subperiosteally. On incising the pleura, about a pint of pus was evacuated. The cavity was freely washed out with warm boric-acid solution, a large drainage-tube introduced and secured by stitching to the skin incision, the margins of which were approximated, and a liberal antiseptic dressing was applied. During the next week the cavity was syringed out three times daily with warm boric-acid solution. The patient was up in a chair on the sixth day, and walking about on the eighth day. There was at this time very little discharge, the cavity being now irrigated but once daily. The cavity gradually contracted, the patient's health improved, and by the seventeenth day the chest would hold but two-fifths as much as it did immediately after operation. In this condition the patient returned to his home under the care of his physician.

CASE II.—*Empyema; Costal Resection; Recovery*.—V. E., aged twenty-five years, came to the hospital on account of pain in the right side of the chest, and dyspnœa. There was nothing in the family history or in the personal history of the patient which had any bearing on the present illness. The first symptom was noticed a year ago, with pain in the right chest, dyspnœa, and cough. Inspection showed the right chest to be distended and motionless

and the intercostal spaces bulging; as drugs failed to reduce the effusion, the chest was aspirated eleven times; at first the fluid was clear, but at the fifth aspiration it was turbid, and at the subsequent tapplings was distinctly purulent. During all this time the patient had fever of an irregular type, cough, and dyspnoea; he was confined to bed much of the time, but was usually able to get about for a short time after each tapping. In this condition he was brought for operation. Upon inspection the right side of the chest was seen to be bulging, the intercostal spaces obliterated, and there was a tendency to pointing in the seventh interspace in the mid-axillary line. Percussion gave a flat note and the overlying skin was cedematous.

A curved incision with the base upward and the lower part corresponding with the seventh interspace was made in the axillary line and an inch and a half of the seventh rib was resected subperiosteally. About one hundred ounces of purulent fluid were evacuated. The cavity was irrigated with sublimate solution (1 to 20,000), a large drainage-tube inserted, and the wound closed with sutures; a liberal dressing of antiseptic gauze was applied. On the fourth day the patient was allowed to sit up, the appetite was good, strength improved, and recovery was in every way satisfactory.

CASE III.—*Empyema; Estlander's Operation; Recovery.*—F. S., aged twenty years, came to the hospital on account of an old empyema which had lasted four years. The patient suffered from an attack of pneumonia twelve years ago, from which he had evidently entirely recovered. Four years ago he had a second attack

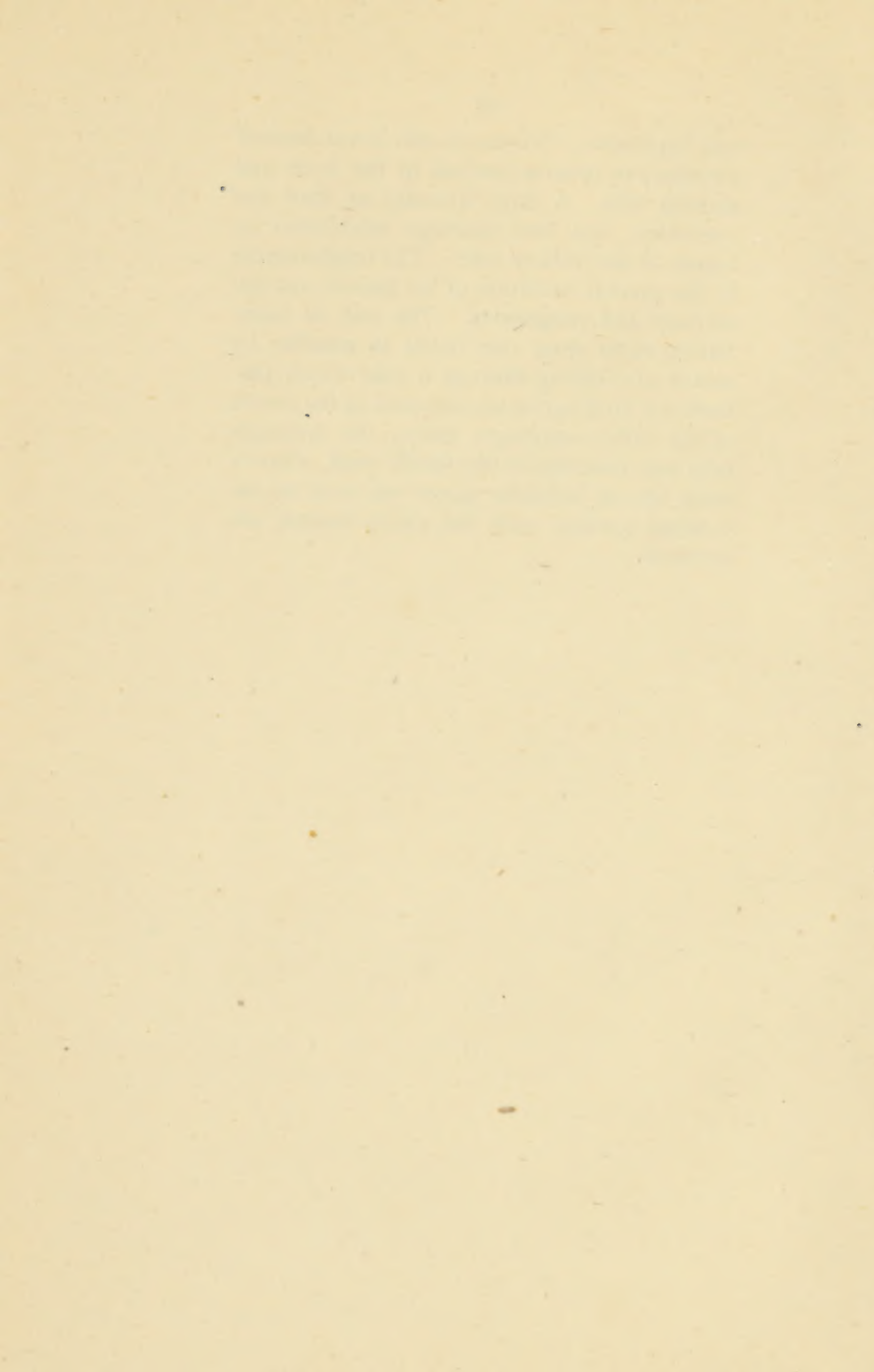
of pneumonia, following which empyema developed. The chest was aspirated and a large quantity of purulent fluid was withdrawn; the collection rapidly reformed, and a second aspiration was performed. As the fluid reaccumulated a small drainage-tube was introduced and allowed to remain for five or six weeks. At the end of this time it was withdrawn and the external opening closed. It was necessary a year later to reopen the wound and introduce another drainage-tube; this tube disappeared, and it was thought entered the pleural cavity. Another tube was put in its place, which had been retained up to the time he came under Dr. White's care; a constant discharge had kept up. It was decided to perform Estlander's operation in order to secure the healing of the cavity. Portions of the sixth, seventh, eighth, and ninth ribs were resected. A careful search for the missing tube with the finger failed to disclose it; the cavity was then irrigated with sublimate solution (1 to 20,000) and packed with strips of iodoform gauze; the wound was then covered by a thick dressing of antiseptic gauze. The patient bore the operation well. The packing was removed on the second day after the operation. There was a large collection of fetid pus, and with this a portion of drainage-tube six inches in length was discharged. This was curled up in a round mass and held in this position by lymph. The tube had probably been encapsulated, and the packing had caused this to break down, which resulted in the discharge of the tube. The convalescence of the patient was rapid and satisfactory. The lung gradually expanded, and at the end of two weeks

had nearly filled the cavity of the chest on that side. At the end of a month the cavity was so small that a tube could no longer be introduced, and the second incision was, therefore, kept open by a tent of iodoform gauze; the patient at this time was going out every day. A week later he was discharged, having entirely regained his health and the wound completely healed to the level of the surface, and requiring but a few more days for cicatrization.

CASE IV.—*Empyema; Estlander's Operation; Recovery*.—F. M., aged thirty-three years, was suffering from a large empyema which filled the whole left side of the chest, for which it was decided to resect portions of the fifth, sixth, and seventh ribs, which was done through a large horseshoe-shaped flap. Two inches were removed from the fifth rib, two and a half inches from the sixth rib, and three inches from the seventh rib. The subsequent treatment was the same as in the other cases. The health and strength of the patient rapidly improved and the cavity diminished in size; but, owing to the impossibility of control of the patient, a sinus persisted, which, however, did not interfere in any way with the usual occupation. Death occurred two and a half years later from an acute intestinal affection.

CASE V.—*Empyema; Costal Resection; Recovery*.—R. S., aged twenty-one years, was suffering from a large empyema which had followed a pneumonia. After it was found that the medicinal treatment would not induce the absorption of the fluid, the chest was aspirated. The accumulation rapidly recurred, and as the condition of the patient was becoming one of hectic, the necessity for securing free drainage

was imperative. To secure this it was deemed necessary to remove portions of the sixth and seventh ribs. A large quantity of fluid was evacuated, and free drainage established by means of the rubber tube. The improvement in the general condition of the patient was immediate and progressive. The task of transferring water from one bottle to another by means of blowing through a tube which perforated a cork accurately adjusted to the mouth of the bottle was begun early; the drainage-tube was removed in the fourth week, when a small tent of iodoform gauze was used in the external opening until the cavity became obliterated.



JANUARY 16, 1893.

WHOLE SERIES, VOL. XVII.

No. 1.

THIRD SERIES, VOL. IX.

—THE—
Therapeutic Gazette

A MONTHLY JOURNAL

—OF—

General, Special, and Physiological Therapeutics.

GENERAL THERAPEUTICS,

H. A. HARE, M.D.,

Professor of Therapeutics in the Jefferson Medical College.

OPHTHALMIC AND AURAL THERAPEUTICS,

O. E. DE SCHWEINITZ, M.D.,

Clinical Professor of Ophthalmology in the
Jefferson Medical College.

SURGICAL AND GENITO-URINARY THERAPEUTICS,

EDWARD MARTIN, M.D.,

Clinical Professor of Genito-Urinary Diseases, University of
Pennsylvania.

EDITORIAL OFFICE, 222 South Fifteenth St., Philadelphia, U.S.A.



All subscriptions and communications relating to the business management should be addressed to the Publisher,

GEORGE S. DAVIS, DETROIT, MICH., U.S.A.,

OR

714 Filbert Street, Philadelphia, Pa.

Published on the Fifteenth Day of Every Month.

SUBSCRIPTION PRICE, TWO DOLLARS A YEAR.

Agents for Great Britain: Mr. H. K. LEWIS, Medical Publisher and Bookseller, 131 Great Street, London, W. C.

Entered at the Post-Office at Philadelphia, Pa., as second class mail matter.

Copyright, 1893, by GEORGE S. DAVIS.

PRINTED BY J. S. LEITCH COMPANY, PHILADELPHIA.